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For: DATA PROCESSING SYSTEM AND METHOD FOR MAINTAINING SECURE DATA BLOCKS

XX 4 Sheets of Drawing(s) are enclosed.

XX 20 Pages of Specification are enclosed.

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RP9-99-048

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**DATA PROCESSING SYSTEM AND METHOD FOR MAINTAINING SECURE
DATA BLOCKS**

Background of the Invention

1. Field of the Invention:

5 The present invention relates in general to data
processing systems and, in particular, to a data processing
system and method for maintaining secure blocks of data
within the system. Still more particularly, the present
invention relates to a data processing system and method for
maintaining secure blocks of data within the system by
encrypting the blocks of data utilizing a hardware master
key pair.

2. Description of the Related Art:

10 Personal computer systems are well known in the art.
They have attained widespread use for providing computer
power to many segments of today's modern society. Personal
computers (PCs) may be defined as a desktop, floor standing,
or portable microcomputer that includes a system unit having
a central processing unit (CPU) and associated volatile and
20 non-volatile memory, including random access memory (RAM)
and basic input/output system read only memory (BIOS ROM), a
system monitor, a keyboard, one or more flexible diskette
drives, a CD-ROM drive, a fixed disk storage drive (also
known as a "hard drive"), a pointing device such as a mouse,
25 and an optional network interface adapter. One of the
distinguishing characteristics of these systems is the use
of a motherboard or system planar to electrically connect
these components together. Examples of such personal

computer systems are IBM's PC 300 series, Aptiva series, and Intellistation series.

Encryption algorithms are known to ensure that only the intended recipient of a message can read and access the message. One known encryption algorithm is an asymmetric, or public key, algorithm. The public key algorithm is a method for encrypting messages sent from a first computer system to a second computer system. This algorithm provides for a key pair including a public key and a private key for each participant in a secure communication. This key pair is unique to each participant. An example of such an encryption scheme is an RSA key pair system.

With the proliferation of Internet services, a need has arisen to identify and authenticate the remote users. For example, an Internet electronic mail service requires a user's name and password prior to permitting access to the user's account. Many other Internet services also require a user's name and password prior to permitting access.

In order to provide more efficient access to these services, an Internet service may provide a block of data, commonly called a "cookie", to a client computer system which includes information typically needed by the service. The cookie includes information associated with both a particular user and the service which provided the cookie. The cookie often includes the associated user's name, and password, and may include the user's credit card information, address, preferences for using the service, and other data. Therefore, a cookie stores information associated with a particular user for a particular service.

A single user may have many cookies stored on the user's computer. The cookies are not secure. An

unauthorized user could copy a user's cookies to another computer system, and thereby gain access to the valuable information stored within the cookies.

Therefore a need exists for a data processing system
5 and method for maintaining secure data blocks.

SECRET
SECRET

SUMMARY OF THE INVENTION

A data processing system and method are disclosed for maintaining a secure data block within the system. A block of data is established within the system. The block of data is associated with a particular user and a particular application. A hardware master key pair is established for the system. The hardware master key pair includes a master private key and a master public key. The hardware master key pair is associated with the system for which it was established so that the master private key is known to only that system. The block of data is encrypted utilizing the master public key. The master private key is required to decrypt the encrypted block of data. This data processing system is the only system capable of decrypting the encrypted block of data.

The above as well as additional objectives, features, and advantages of the present invention will become apparent in the following detailed written description.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel features are set forth in the appended claims. The present invention itself, however, as well as a preferred mode of use, further objectives, and advantages thereof, will best be understood by reference to the following detailed description of a preferred embodiment when read in conjunction with the accompanying drawings, wherein:

Figure 1 illustrates a pictorial representation of a data processing system in accordance with the method and system of the present invention;

Figure 2 depicts a more detailed pictorial representation of the data processing system of **Figure 1** in accordance with the method and system of the present invention;

Figure 3 illustrates a high level flow chart which depicts establishing and storing a secure data block utilizing a hardware master key pair in a data processing system in accordance with the method and system of the present invention; and

Figure 4 depicts a high level flow chart which illustrates utilizing an encrypted data block to access an application associated with the data block in accordance with the method and system of the present invention.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

A preferred embodiment of the present invention and its advantages are better understood by referring to Figures 1-4 of the drawings, like numerals being used for like and corresponding parts of the accompanying drawings.

The present invention is a method and system for maintaining a secure data block within the system. A block of data is established within the system and is associated with a particular user and a particular application. The block of data includes information regarding the associated user and application. For example, the data block may include a user's name, password, and credit card number.

A hardware master key pair is established for the system. The hardware master key pair includes a master private key and a master public key. The hardware master key pair is associated with the system so that the master private key is known to only the data processing system for which it was established.

The data block is encrypted utilizing the master public key. The encrypted data block is stored in non-protected storage. The master private key is required to decrypt the encrypted block of data. Only this data processing system is capable of decrypting the encrypted block of data. If the encrypted data block is copied to another data processing system, the data will be protected because the other data processing system will not have the first system's master private key, and will not be able to decrypt the encrypted data block.

When the data block is needed, such as by a browser program in order to access the associated application, the

decrypted data block is requested from the encryption device. The encrypted data block is then decrypted by the encryption device utilizing the hardware private key, which is stored in the encryption device.

5 **Figure 1** illustrates a pictorial representation of a data processing system including a plurality of client computer systems **104** coupled to a server computer system **100** utilizing a hub **102** in accordance with the method and system of the present invention. Each client computer system **104** and server computer system **100** may be implemented utilizing a computer system **30**. Server computer system **100** and client computer systems **104** are connected to hub **102** utilizing a communication link **106**. Communications link **106** may conform to a local area network standard such as the Ethernet specification, or may be a wide area network (WAN) utilizing a telephone network. Those skilled in the art will recognize that the invention described herein may be implemented utilizing any suitable type of data communications channel or link. In addition, communications link **106** may simultaneously include multiple different types of data communications channels.

Computer system **30** includes a computer **12**, a monitor **13**, a keyboard **14**, and a printer or plotter **15**. Computer system **30** may be implemented utilizing any commercially available computer system which has been suitably programmed and which has been modified as described below.

30 **Figure 2** depicts a more detailed pictorial representation of the data processing system of **Figure 1** in accordance with the method and system of the present invention. Computer **12** includes a planar (also commonly called a motherboard or system board) which is mounted within computer **12** and provides a means for mounting and

electrically interconnecting various components of computer 12 including a central processing unit (CPU) 200, system memory 206, and accessory cards or boards as is well known in the art.

5 CPU 200 is connected by address, control, and data busses 202 to a memory controller and peripheral component interconnect (PCI) bus bridge 204 which is coupled to system memory 206. An integrated drive electronics (IDE) device controller 220, and a PCI bus to Industry Standard
10 Architecture (ISA) bus bridge 204 are connected to PCI bus bridge 204 utilizing PCI bus 208. IDE controller 220 provides for the attachment of IDE compatible storage devices, such a removable hard disk drive 222. PCI/ISA bridge 212 provides an interface between PCI bus 208 and an optional feature or expansion bus such as the ISA bus 214. PCI/ISA bridge 212 includes power management logic. PCI/ISA bridge 212 is supplied power from battery 244 to prevent loss of configuration data stored in CMOS 213.

20 A PCI standard expansion bus with connector slots 210 is coupled to PCI bridge 204. PCI connector slots 210 may receive PCI bus compatible peripheral cards. An ISA standard expansion bus with connector slots 216 is connected to PCI/ISA bridge 212. ISA connector slots 216 may receive ISA compatible adapter cards (not shown). It will be
25 appreciated that other expansion bus types may be used to permit expansion of the system with added devices. It should also be appreciated that two expansion busses are not required to implement the present invention.

30 An I/O controller 218 is coupled to PCI-ISA bridge controller 212. I/O controller 218 controls communication between PCI-ISA bridge controller 212 and devices and

peripherals such as floppy drive **224**, keyboard **14**, and mouse **228** so that these devices may communicate with CPU **200**.

PCI-ISA bridge controller **212** includes an interface for a flash memory **242** which includes an interface for address, data, flash chip select, and read/write. Flash memory **242** is an electrically erasable programmable read only memory (EEPROM) module and includes BIOS that is used to interface between the I/O devices and operating system.

Computer **12** includes a video controller **246** which may, for example, be plugged into one of PCI expansion slots **210**. Video controller **246** is connected to video memory **248**. The image in video memory **248** is read by controller **246** and displayed on monitor **13** which is connected to computer **12** through connector **250**.

Computer system **12** includes a power supply **240** which supplies full normal system power **243**, and has an auxiliary power main AUX 5 **241** which supplies full time power to the power management logic **212**, and to a network adapter **230**.

Network adapter **230** includes a physical layer **234** and a media access controller (MAC) **232** coupled together utilizing a Media Independent Interface (MII) bus **252**. The MII bus **252** is a specification of signals and protocols which define the interfacing of a 10/100 Mbps Ethernet Media Access Controller (MAC) **232** to the underlying physical layer **234**. Network adapter **230** may be plugged into one of the PCI connector slots **210** (as illustrated) or one of the ISA connector slots **216** in order to permit computer system **30** to communicating with server **100** utilizing communications link **106**.

MAC 232 processes digital network signals, and serves as an interface between a shared data path, i.e. the MII bus 252, and the PCI bus 208. MAC 232 performs a number of functions in the transmission and reception of data packets. For example, during the transmission of data, MAC 232 assembles the data to be transmitted into a packet with address and error detection fields. Conversely, during the reception of a packet, MAC 232 disassembles the packet and performs address checking and error detection. In addition, MAC 232 typically performs encoding/decoding of digital signals transmitted over the shared path and performs preamble generation/removal, as well as bit transmission/reception. In a preferred embodiment, MAC 232 is an Intel 82557 chip. However, those skilled in the art will recognize that the functional blocks depicted in network adapter 230 may be manufactured utilizing a single piece of silicon.

Physical layer 234 conditions analog signals to go out to the network via an R45 connector 236. Physical layer 234 may be a fully integrated device supporting 10 and 100 Mbps CSMA/CD Ethernet applications. Physical layer 234 receives parallel data from the MII local bus 252 and converts it to serial data for transmission through connector 236 and over the network. Physical layer 234 is also responsible for wave shaping and provides analog voltages to the network. In a preferred embodiment, physical layer 234 is implemented utilizing an Integrated Services chip ICS-1890.

Physical layer 234 includes auto-negotiation logic that serves three primary purposes. First, it determines the capabilities of computer system 30. Second, it advertises its own capabilities to server computer 100. Third, it establishes a connection with server computer 100 using the highest performance connection technology.

In accordance with the present invention, the planar includes an encryption device 261 which includes an encryption/decryption engine 260 which includes an encryption/decryption algorithm which is utilized to encode and decode messages transmitted and received by the planar, and protected storage 262. Engine 260 can preferably perform public/private key encryption. Engine 260 may access a protected storage device 262. Protected storage device 262 is accessible only through engine 260, and is a one-time writable device. Therefore, storage device 262 cannot be read or written to by the planar or any other device after the keys have programmed by system manufacturing or the system owner. Hardware master keys stored within storage 262 are protected by engine 260 and are not accessible to the planar or its components. Storage device 262 is utilized to store the hardware master key pair, including the master private key and master public key. Device 262 may be implemented utilizing an electronically erasable storage device, such as an EEPROM. Access may be gained to non-readable storage device 262 in order to initially store the master private key. However, after the master private key is stored, it cannot be read. The keys stored in EEPROM 262 may not be read by any component of the planar other than engine 260.

Encryption device 261, including engine 260 and EEPROM 262, is coupled to PCI-ISA bridge 212 utilizing a system management (SM) bus 238. System management bus 238 is a two-wire, low speed, serial bus used to interconnect management and monitoring devices. Those skilled in the art will recognize that encryption device 261 may be coupled to another bus within the planar.

Figure 3 illustrates a high level flow chart which depicts establishing and storing a secure data block

utilizing a hardware master key pair in a data processing system in accordance with the method and system of the present invention. The process starts as depicted at block 300 and thereafter passes to block 302 which illustrates establishing a hardware master key pair for data processing system 30. Next, block 304 depicts the storage of the master public key and master private key in protected storage 262 which is a one-time writable, protected storage in the encryption device. The process then passes to block 306 which illustrates an application executing on server computer system 100 establishing a data block which includes valuable information. The data block is associated both with a particular user and the application.

Next, block 308 depicts the encryption of the data block, including the valuable information, with the hardware master public key. Thereafter, block 310 illustrates the storage of the encrypted data block in storage within computer system 30 such as hard drive 222. The process then terminates as illustrated at block 312.

Figure 4 depicts a high level flow chart which illustrates utilizing an encrypted data block to access an application associated with the data block in accordance with the method and system of the present invention. The process starts as illustrated at block 400 and thereafter passes to block 402 which depicts a browser initiating a session with an application or site. Thereafter, block 406 depicts the browser identifying the data block associated with the user and the selected application, and requesting the data block from the encryption device.

Next, block 408 illustrates the identified, encrypted data block being copied from storage into the encryption device. Thereafter, block 410 depicts the encryption device

decrypting the data block utilizing the hardware private
key. The process then passes to block 412 which illustrates
the encryption device sending the decrypted data block to
the browser. Next, block 414 depicts the browser sending
the decrypted data block or components of the decrypted data
block to the application. The process then terminates as
illustrated at block 416.

While a preferred embodiment has been particularly
shown and described, it will be understood by those skilled
in the art that various changes in form and detail may be
made therein without departing from the spirit and scope of
the present invention.

CLAIMS:

1. A method in a data processing system for maintaining a secure data block within said system, said method comprising the steps of:

5 establishing a block of data within said system, said block of data being associated with a particular user and a particular application;

establishing a hardware master key pair for said system, said hardware master key pair including a master private key and a master public key, said hardware master key pair being associated with said system so that said master private key is known to only said system; and

encrypting said block of data utilizing said master public key, said master private key being required to decrypt said encrypted block of data, wherein only said data processing system is capable of decrypting said encrypted block of data.

2. The method according to claim 1, further comprising the step of storing said encrypted block of data in a non-protected storage device.

3. The method according to claim 2, further comprising the steps of:

establishing an encryption device having an encryption engine and a protected storage device, said protected storage device being accessible only through said encryption engine; and

storing said hardware master key pair in said protected storage device.

4. The method according to claim 3, further comprising the step of said encryption engine encrypting said block of data utilizing said master public key stored in said protected storage device.

5. The method according to claim 4, further comprising the step of a remote data processing system executing said application.

6. The method according to claim 5, further comprising the step of establishing a browser program for accessing said application.

7. The method according to claim 6, further comprising the steps of:

said browser program initiating a session with said application;

said browser requesting said encryption device to decrypt said encrypted block of data;

in response to said request, said encryption device decrypting said encrypted block of data utilizing said master private key; and

said encryption device transmitting said decrypted block of data to said browser program.

8. The method according to claim 7, further comprising the step of said browser program transmitting said decrypted block of data to said application.

9. The method according to claim 8, wherein said step of storing said encrypted block of data in said non-protected storage further comprises the step of storing said encrypted block of data in a hard drive.

5 10. A data processing system for maintaining a secure data block within said system, comprising:

said system executing code for establishing a block of data within said system, said block of data being associated with a particular user and a particular application;

10 said system executing code for establishing a hardware master key pair for said system, said hardware master key pair including a master private key and a master public key, said hardware master key pair being associated with said system so that said master private key is known to only said system; and

15 said system executing code for encrypting said block of data utilizing said master public key, said master private key being required to decrypt said encrypted block of data, wherein only said data processing system is capable of
20 decrypting said encrypted block of data.

11. The system according to claim 10, further comprising said system executing code for storing said encrypted block of data in a non-protected storage device.

12. The system according to claim 11, further comprising:

25 an encryption device having an encryption engine and a protected storage device, said protected storage device being accessible only through said encryption engine; and

said encryption device executing code for storing said hardware master key pair in said protected storage device.

13. The system according to claim 12, further comprising said encryption engine executing code for encrypting said block of data utilizing said master public key stored in said protected storage device.

14. The system according to claim 13, further comprising a remote data processing system capable of executing said application.

15. The system according to claim 14, further comprising said system executing code for establishing a browser program for accessing said application.

16. The system according to claim 15, further comprising:

said system executing code for said browser program initiating a session with said application;

said system executing code for said browser requesting said encryption device to decrypt said encrypted block of data;

in response to said request, said encryption device capable of decrypting said encrypted block of data utilizing said master private key; and

said encryption device executing code for transmitting said decrypted block of data to said browser program.

17. The system according to claim 16, further comprising said system executing code for said browser program

transmitting said decrypted block of data to said application.

18. The system according to claim 17, further comprising a hard drive for storing said encrypted block of data.

5 19. A data processing system for maintaining a secure data block within said system, comprising:

said system executing code for establishing a block of data within said system, said block of data being associated with a particular user and a particular application;

10 an encryption device executing code for establishing a hardware master key pair for said system, said hardware master key pair including a master private key and a master public key, said hardware master key pair being associated with said system so that said master private key is known to only said system;

15 said system executing code for encrypting said block of data utilizing said master public key, said master private key being required to decrypt said encrypted block of data, wherein only said data processing system is capable of
20 decrypting said encrypted block of data;

said system executing code for storing said encrypted block of data in a hard drive;

25 said encryption device having an encryption engine and a protected storage device, said protected storage device being accessible only through said encryption engine;

said encryption device executing code for storing said hardware master key pair in said protected storage device;

said encryption engine executing code for encrypting said block of data utilizing said master public key stored in said protected storage device;

a remote data processing system capable of executing said application;

said system executing code for establishing a browser program for accessing said application;

said system executing code for said browser program initiating a session with said application;

said system executing code for said browser requesting said encryption device to decrypt said encrypted block of data;

in response to said request, said encryption device capable of decrypting said encrypted block of data utilizing said master private key;

said encryption device executing code for transmitting said decrypted block of data to said browser program;

said system executing code for said browser program transmitting said decrypted block of data to said application.

ABSTRACT OF THE DISCLOSURE

DATA PROCESSING SYSTEM AND METHOD FOR MAINTAINING SECURE
DATA BLOCKS

5 A data processing system and method are disclosed for
maintaining a secure data block within the system. A block of
data is established within the system. The block of data is
associated with a particular user and a particular
application. A hardware master key pair is established for
the system. The hardware master key pair includes a master
private key and a master public key. The hardware master key
pair is associated with the system for which it was
established so that the master private key is known to only
that system. The block of data is encrypted utilizing the
master public key. The master private key is required to
decrypt the encrypted block of data. This data processing
system is the only system capable of decrypting the encrypted
block of data.

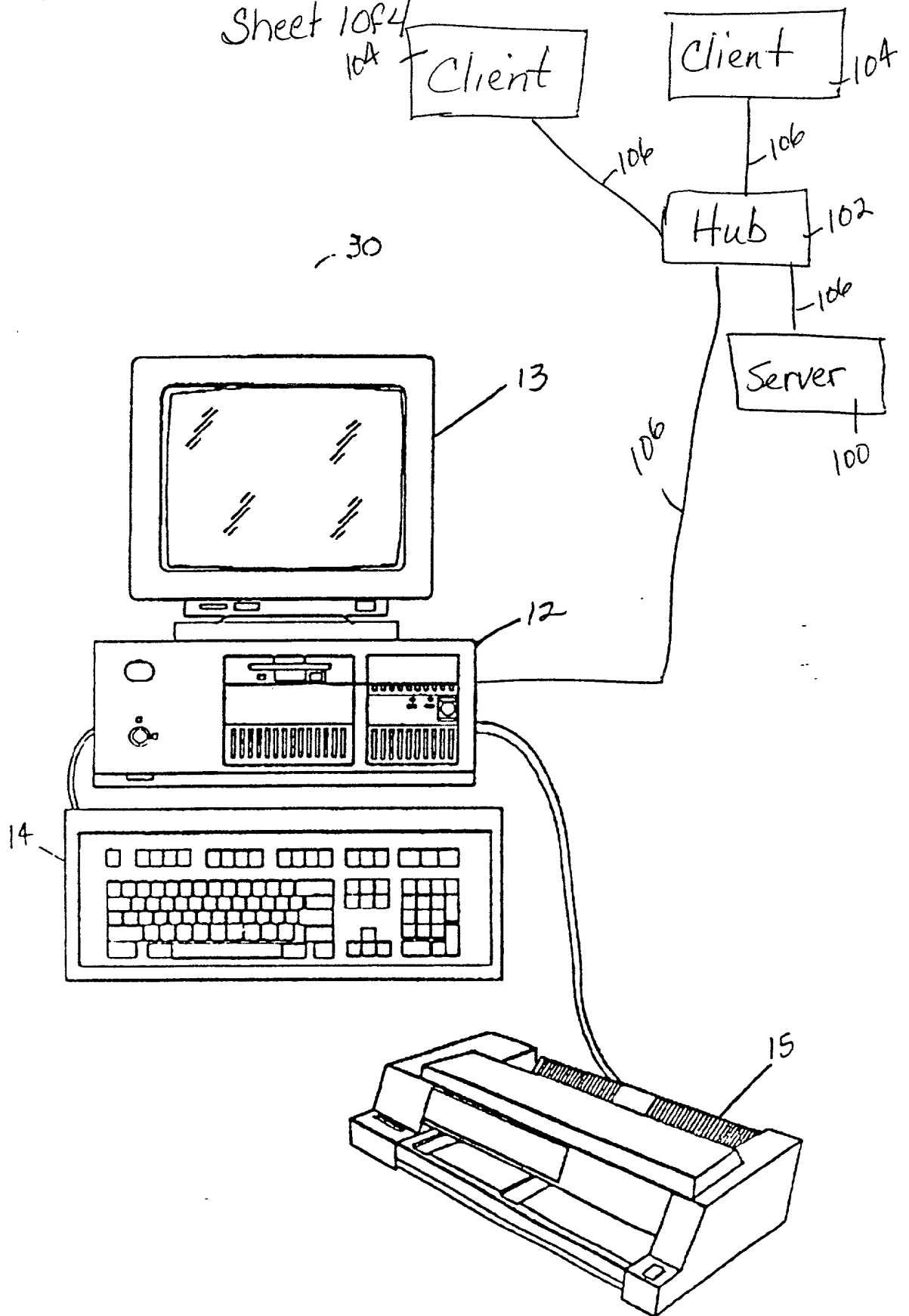


Fig. 1

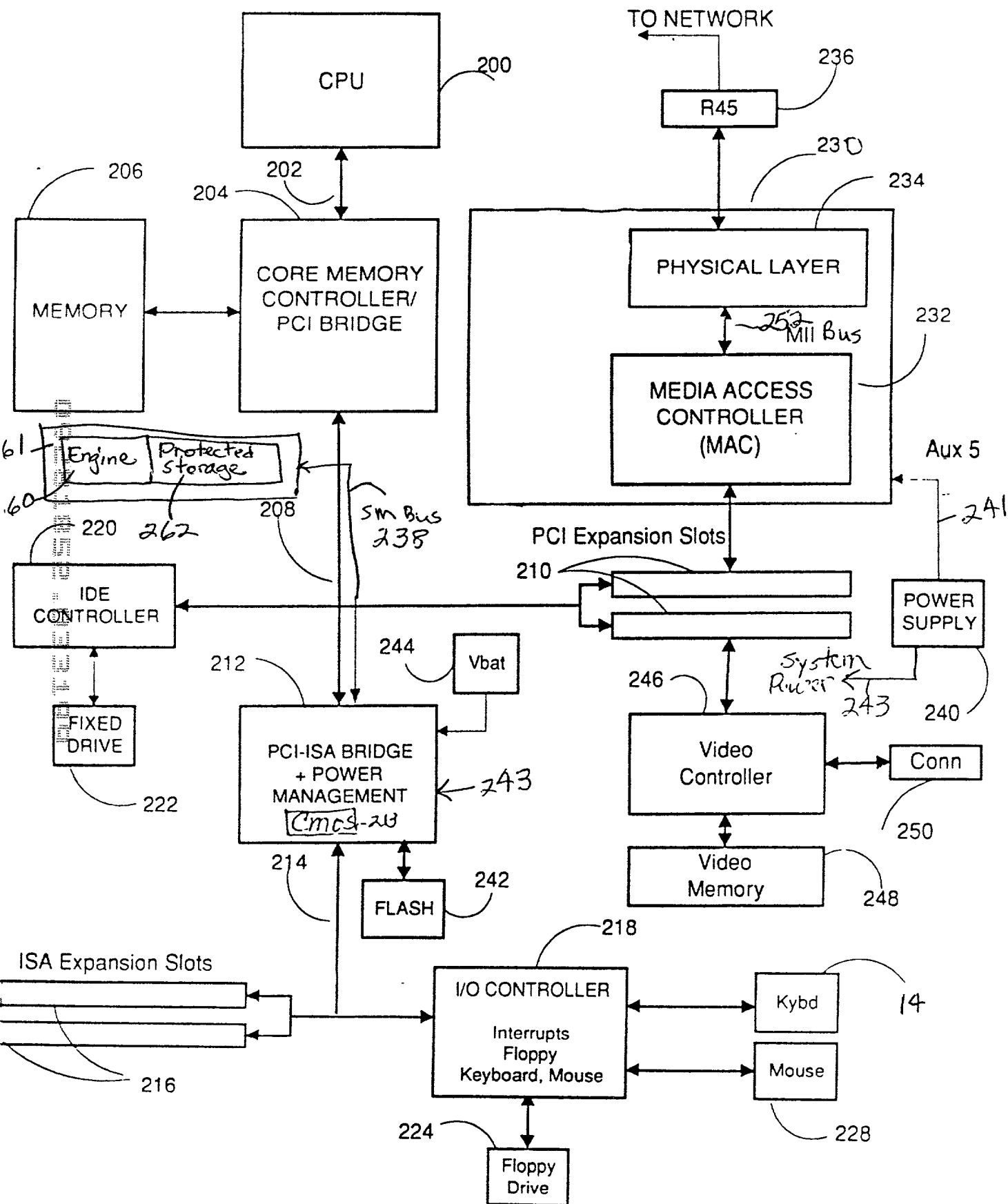


Fig. 2

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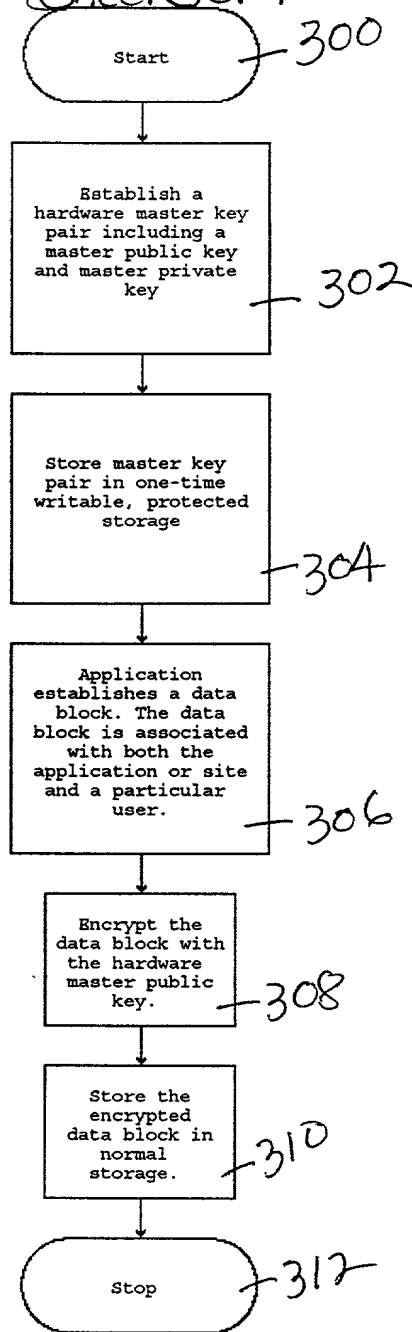


Fig. 3

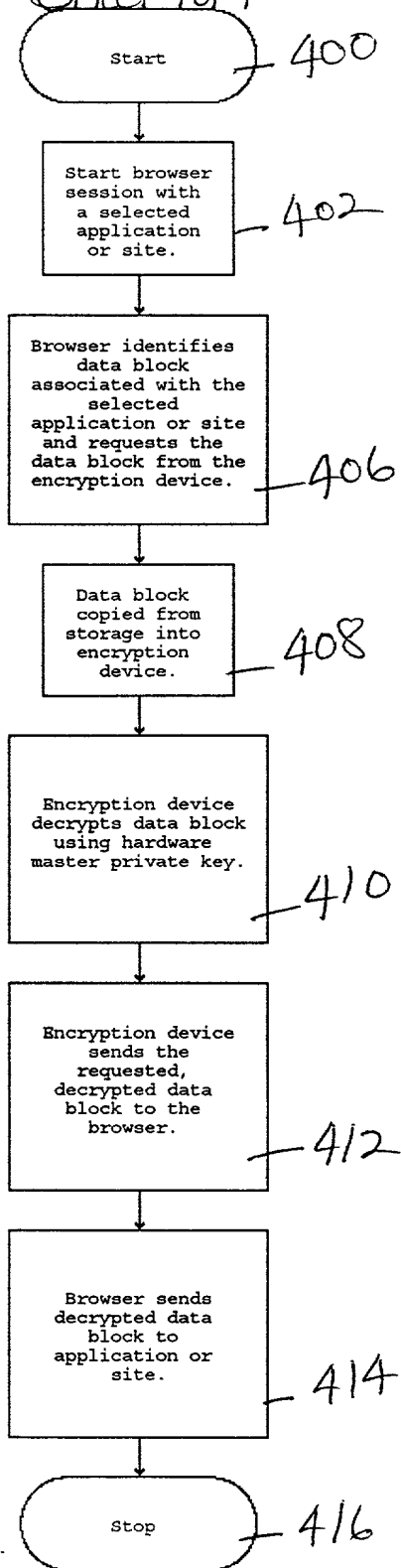


Fig. 4

**DECLARATION AND POWER OF ATTORNEY FOR
PATENT APPLICATION**

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name;

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

DATA PROCESSING SYSTEM AND METHOD FOR MAINTAINING SECURE DATA BLOCKS

the specification of which (check one)

X is attached hereto.

_____ was filed on _____
as Application Serial No. _____
and was amended on _____
(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s):			Priority Claimed
_____ (Number)	_____ (Country)	_____ (Day/Month/Year)	____ Yes ____ No

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information material to the patentability of this application as defined in Title 37, Code of Federal Regulations, §1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

_____ (Application Serial #)	_____ (Filing Date)	_____ (Status)
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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both,

under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorneys and/or agents to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

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